BTEC Assignment Brief

Qualification	Pearson BTEC International Level 3 Diploma in Engineering Pearson BTEC International Level 3 Diploma in Electrical/Electronic Engineering Pearson BTEC International Level 3 Extended Diploma in Engineering Pearson BTEC International Level 3 Extended Diploma in Electrical/Electronic Engineering
Unit number and title	**Unit 17: Power and Energy Electronics**
Learning aim(s)	**B:** Explore applications of common power electronic devices that are used to modify a form of electrical energy
Assignment title	DC motor control and voltage control circuits
Assessor	
Issue date	
Hand in deadline	

Vocational Scenario or Context	You are working as a final year apprentice technician for an engineering organisation that manufactures DC motor control circuits and voltage conversion circuits. Your job includes constructing control circuits that make use of power electronic devices. Your supervisor is pleased with your work, and your general understanding of the circuits that you construct. Your supervisor has asked you to investigate a range of different types of control circuits, to construct examples of each type of control circuit and to demonstrate your understanding of each circuit.
Task 1	You are going to investigate and evaluate the operation of power electronic devices in DC motor control and voltage conversion circuits. As part of your investigation you will need to safely build each control circuit and then compare experimental results with theoretical calculations. **To do this:** Your tutor will provide you with a range of power electronic devices that are used in control circuits. You are to construct a range of electronic circuits to investigate their operation. **You need to:** Use appropriate components/rapid prototyping systems to construct circuits to investigate the following: • speed control using pulse width modulation (PWM) • speed and direction control using a MOSFET H-bridge. • uncontrolled and controlled half-wave rectification of a single phase alternating current (AC) supply using a pn junction diode and a thyristor • fixed voltage regulated full-wave rectification of a single phase alternating current (AC) supply using pn junction diodes. • fixed voltage regulators and switching regulators used in DC to DC conversion For each circuit you will need to take and record accurate measurements, and include information such as circuit schematics

	and waveform sketches from test instruments. **You will also need to:** Research single phase half-wave voltage invertors that use switch elements. **You then need to:** Use your results and research to draw conclusions regarding the operation of power electronic devices in DC motor control and voltage conversion circuits. You should consider the measurements taken from your physical circuits, the theoretical behaviour of each circuit, and also provide comparisons between the different ways that the required outcome can be achieved.
Checklist of evidence required	A portfolio of evidence collating practical experiment reports exploring DC motor control and voltage control circuits. To include observation records, images, theoretical data and calculations.

Criteria covered by this task:	
Unit/Criteria reference	To achieve the criteria you must show that you are able to:
17/B.D2	Evaluate the operation of DC motor speed and direction control and voltage conversion circuits employing a range of power electronic devices safely, using test results and theory.
17/B.M3	Build, using BJT and MOSFET devices, a DC motor speed control circuit safely and determine accurate operating characteristics of each.
17/B.M4	Analyse, using test results and theory, the correct operation of DC motor speed control circuits.
17/B.M5	Build a controlled and uncontrolled AC–DC rectifier and a DC–DC converter safely and accurately determine the operating characteristics of each.
17/B.M6	Analyse, using test results and theory, the operation of voltage converters, including controlled and uncontrolled AC–DC, DC–DC and DC–AC.
17/B.P3	Build, using BJT and MOSFET devices, a DC motor speed control circuit safely and determine the operating characteristics of each.
17/B.P4	Explain, using test results and theory, the correct operation of DC motor speed control circuits.
17/B.P5	Build a controlled and uncontrolled AC–DC rectifier and a DC–DC converter safely and determine the operating characteristics of each.
17/B.P6	Explain, using test results and theory, the operation of voltage converters, including controlled and uncontrolled AC–DC, DC–DC and DC–AC.

Sources of information to support you with this Assignment	Books Introduction to Power Electronics; Fewson, D.; Butterworth-Heinemann, 1998; ISBN 9780080535111 Power Electronics and Motor Control ; Shepherd, W et al; Cambridge University Press, 1995; ISBN 9780521478137 Websites electronics-tutorials.ws allaboutcircuits.com electricaleasy.com/2014/01/speed-control-methods-of-dc-motor.html Further useful resources may be found at qualifications.pearson.com/en/support/published-resources.html#step1
Other assessment materials attached to this Assignment Brief	Component/system reference data.